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The Impact of the General Mining Association on the Nova Scotia Coal Industry, 1826 - 1850

IN THE AGE OF THE INDUSTRIAL REVOLUTION abundant deposits of coal frequently attracted industry and led to vigorous economic growth; coal-rich regions of England, Scotland and Belgium led neighbouring coal-poor regions in early industrialization. Similarly, the development of heavy industry accelerated in the United States only when good-quality coal became readily available.[1] The correlation between industrialization and coal deposits is not surprising. Coal is a bulky commodity consumed in the production process, so that the high transportation costs of the early 19th century encouraged industry to move to coal deposits. Heavy industry, requiring heat, was particularly attracted to abundant supplies of coal.[2] It is true that wood and water power were important substitutes for coal, and where they were abundant they supported considerable growth, as in the textile industry of New England. However, in most cases continued industrialization was facilitated by the ability to substitute coal for wood. An early start in the use of coal gave local industry a great advantage later in the 19th century when wood and water power became inadequate energy sources for industry.[3]

1 Alfred D. Chandler, "Anthracite Coal and the Beginnings of the Industrial Revolution in the United States", *Business History Review*, 46 (1972), pp. 141-81, Peter Temin, "Steam and Waterpower in the Early Nineteenth Century" *The Journal of Economic History*, 26 (1966), pp. 187-205, and Peter Temin, "A New Look at Hunter's Hypothesis about the Antebellum Iron Industry", *The American Economic Review*, 54 (1964), pp. 344-51.

2 J. H. Dales, "Fuel, Power and Industrial Development in Central Canada", *American Economic Review*, 43 (1953), pp. 181-98.

3 I would like to thank Alasdair Sinclair of Dalhousie University and Satyadev Gupta of St. Thomas University for their helpful comments made on presentation of this paper to the Atlantic Canada Economics Association, 19 - 21 October 1989. The suggestions of two editors of *Acadiensis*, Gail Campbell and David Frank, and three anonymous reviewers have been most helpful in improving the paper. I would also like to thank Neil MacKinnon of St. Francis Xavier University for his careful reading of the typescript, R. Roger and the staff at the Beaton Institute for their particularly friendly and helpful assistance, and Ahmed Garriba and Marci Baker for their important contribution as research assistants. This paper was supported by a St. Francis Xavier University, University Council for Research grant.

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Nova Scotia was unique in the settled regions of early 19th century British North America in possessing extensive coal deposits located near ocean transportation. From 1828 to 1858 the right to exploit this resource was controlled by a London-based firm, the General Mining Association, which held an exclusive lease of nearly all the mineral rights of Nova Scotia. The significance of the coal industry to Nova Scotia's economy has been demonstrated both in general histories of 19th century Nova Scotia and in industry studies.[4] In addition, the General Mining Association was examined in 1945 by J.S. Martell who demonstrated the dramatic expansion of the coal industry which occurred after the firm was established, and a number of local studies have documented the scope and the impact of the GMA.[5] More recently, D.A. Muise has given a detailed study of the events resulting in the GMA gaining and subsequently losing exclusive control of Nova Scotia mineral rights.[6] Ian McKay has critically evaluated Association, based on an analysis of the mercantilist biases of the GMA and an interpretation of dependent "enclave" development.[7]

The lease obtained by the GMA established a property rights regime in which

4 Studies of the early industry by contemporaries are found in Abraham Gesner, *The Industrial Resources of Nova Scotia* (Halifax, 1849); Richard Brown, *Coal Fields and Coal Trade of the Island of Cape Breton* (London, 1871); and C. Campbell, *Nova Scotia in its Historical, Mercantile and Industrial Relations*, (Montreal, 1873). Discussions of the early industry are found in C. Ochiltree MacDonald, *The Coal and Iron Industries of Nova Scotia* (Halifax, 1909), W.J. Donald, *The Canadian Iron and Steel Industry* (Boston, 1915), W.A. Bell, *The Pictou Coalfield, Nova Scotia* [Geological Survey memoir 225, Department of Mines and Resources of Canada] (Ottawa, 1940).

5 J.S. Martell, "Early Coal Mining in Nova Scotia", *The Dalhousie Review*, 25 (1945), pp. 156-72. A number of other studies have made important contributions. James Cameron, *The Pictonian Colliers* (Halifax, 1974) gives a very thorough overview of the industry in that county. S.J. Hornsby discusses the impact of the coal industry on Cape Breton in his "An Historical Geography of Cape Breton Island in the Nineteenth Century", Ph.D. thesis, University of British Columbia, 1986. The early history is also touched upon in Hugh Millward, "The Development, Decline, and Revival of Mining on the Sydney Coalfield", *The Canadian Geographer*, 28 (1984), pp. 180-5, and his "Mine Locations and the Sequence of Coal Exploitation on the Sydney Coalfield, 1720-1980", in Kenneth Donovan, ed. *Cape Breton at 200: Historical Essays in Honour of the Island's Bicentennial 1785-1985* (Sydney, 1985), 183-202. Hope Harrison, "The Life and Death of the Cumberland Coal Mines", *Nova Scotia Historical Review*, 5 (1985), pp. 73-83 dispenses with little praise in her brief discussion of the Association. David Frank, "Richard Smith", *Dictionary of Canadian Biography*, Vol. IX (Toronto, 1976), pp. 730-2 provides information on the early days of the GMA.

6 D.A. Muise, "The General Mining Association and Nova Scotia's Coal", *Bulletin of Canadian Studies*, 6/7 (1983), pp. 71-87.

7 "The Crisis of Dependent Development: Class Conflict in the Nova Scotia Coalfields, 1872-1876", *Canadian Journal of Sociology*, 13 (1988), pp. 9-48. The same author in "Industry, Work and Community in the Cumberland Coalfields, 1848-1927", Ph.D. thesis, Dalhousie University, 1984, has good reason to note that the early mining activity of the firm was quite limited in Cumberland County.

all coal production in the province was controlled by a single firm based in London. This allocation of property rights to metropolitan interests reduced the potential for economic development and diversification in the hinterland of Nova Scotia in several ways: by limiting investment in coal mining, by allowing price discrimination against Nova Scotians and by causing mismanagement of capital, labour and natural resources in mining which increased the cost of coal. The privileges of the GMA did their greatest damage by excluding local entrepreneurs from accumulating capital in a potentially profitable industry and by raising the price and reducing the availability of coal to local consumers.[8] Alternative property rights regimes of granting ownership of subsurface mineral rights with the grant of land or of granting a lease of the right to mine to anyone who applied were likely to have provided a greater stimulus to industrialization.[9] In the later 19th century, concentrated control of coal deposits became common throughout North America, often as vertically integrated firms secured a reliable raw material supply. In the early 19th century that pattern had not yet appeared and is not considered as an alternative to the property rights regime which did prevail.

The argument presented here supports the view that Nova Scotia had a potential for industrialization which it failed to realize because of the negative influence of policies made by distant governments. However, the impact of the government policies was only one factor among the many determining the development of Nova Scotia, and this should not be interpreted as unqualified support for the view that a different policy would have ensured the extensive and lasting industrialization of Nova Scotia. The argument that early industrialization benefited from local coal deposits does not imply that all regions with coal were well-suited to industrialization. After all, much of the coal-rich American Appalachia now suffers from economic difficulties similar to those of Cape

8 The assumption made here is that a region with a diversified and industrialized economy is likely to generate higher rates of growth in income in the long run than regions which are narrowly specialized in primary product production. While not everyone agrees that high incomes and satisfactory long-run rates of growth in income are incompatible with an economy dominated by primary product production, the considerable controversies about the role of primary products in economic development cannot be discussed here. An alternative approach to this study would be to attempt to measure changes in per capita income caused by different property rights regimes before the middle of the nineteenth century. Aside from the practical difficulties of making such a measurement, I believe such a narrow approach misses the more important issues of changes in economic structure which would have influenced the potential for future growth in income in the economy as a whole.

9 These two alternatives would have had very different impacts on Crown revenues from the coal resources. Contemporary objections to the privileges of the GMA were often based on the reduction in the royalties to the Crown from coal believed to have resulted from the grant to the GMA. The impact of the level of royalties on coal on economic development is a separate issue which is not addressed in this paper.

Breton. While Nova Scotia possessed considerable coal and some iron ore, the lack of abundant good agricultural land might in itself have prevented industrial development by reducing population density and raising the real cost of labour. Geography was kinder to Southern Ontario, for although it lacked the important industrial resources, coal and iron, it did have water power and a cheap supply of food and agricultural raw materials. Access to superior iron and coal was secured through the Great Lakes and allowed continued industrialization when water power became an inadequate energy source. Western Pennsylvania was still more fortunate; it possessed good agricultural land, abundant coal of superior quality, access to iron ore and a location which allowed exports to be floated down the Ohio river at low cost while imports had to be steamed up river or brought overland at greater cost.

Nevertheless by securing exclusive rights to the minerals of the province on far more favourable terms than in previous leases, the firm greatly restricted the early development of the coal industry in the first half of the 19th century and possibly slowed the growth of local industries dependent on coal. When the GMA gained its exclusive mineral rights in the late 1820s both the demand and supply of coal were limited, but both had the potential to expand greatly. Supplies of British coal to North America were limited by high shipping costs and an export duty of 11 shillings a ton until the early 1830s. The duty was quite substantial, since that coal generally sold for approximately seven shillings six pence at the point of export.[10] British coal became important in some regions, particularly after the export duty was removed in the early 1830s, but only where excess capacity allowed coal to be shipped at a nominal rate. The vast soft coal resources of the United States are west of the Appalachians and were inaccessible to east coast cities in the 1820s. The anthracite of Eastern Pennsylvania suffered from high transportation costs as well as from technical difficulties in its use.[11] Only two regions possessed bituminous coal which could be marketed economically on the eastern seaboard: Nova Scotia and Virginia. The latter area had small deposits of mediocre coal, but their location along the James River made them the major American supplier of bituminous coal until transportation improvements allowed more westerly areas to compete.

Markets for coal were also limited in the 1820s. In North America wood or charcoal were usually preferred to coal in manufacturing processes using heat, since they lacked the impurities which reduced quality or raised the cost of producing goods with coal. The demand for coal as a source of motive power through the steam engine was restricted by the relative abundance of water power, which made the water wheel an effective competitor with the steam

10 Martell, "Early Coal Mining", p. 168; Roy Church, *The History of the British Coal Industry Volume Three: 1830-1913: Victorian Pre-eminence* (Oxford, 1986), pp. 52, 65.

11 Chandler, "Anthracite Coal", pp. 151-3.

engine until well into the 19th century. For example, although a total of 100 steam engines were in use in the United States by 1832, most of these machines were small and auxiliary to other sources of power.[12] Only four of the 249 American firms outside of the Pittsburgh area with more than $50,000 in capital used steam as their major source of power in 1832.[13]

Coal has advantages over wood that assured its eventual dominance as a fuel; it contains more energy per ton and it is concentrated in one location, not scattered across the landscape, and the potential for a market to develop is demonstrated by the use of coal in regions where it was relatively abundant. While the steam engine was rare elsewhere in 1832, almost all factories in the Pittsburgh area, with its rich bituminous coal deposits, used steam engines.[14] As cities grew and depleted the wood supplies in their hinterlands for domestic heating and for industrial processes requiring heat, the cost of importing firewood rose, and coal could be sold in urban markets. Halifax, Saint John, St. John's, Boston, New York, Philadelphia, Baltimore, Washington and Richmond all had markets for coal by the 1820s.

In spite of the small market for coal, limited alternative supplies meant that investment in Nova Scotia coal had distinct advantages even in the first quarter of the 19th century. That coal was located nearer to ocean shipping than any other North American deposit. Ocean shipping was so much cheaper than inland shipping (even after the construction of canals and early railroads) that the advantage of location near the sea offset the disadvantage of distance from American markets for some time. As a result, Nova Scotia coal had the opportunity to become a significant part of the North American market for bituminous coal and had for a time a degree of potential monopoly power in northeastern Atlantic markets.[15]

Despite these opportunities coal mining was conducted on a very small scale with little investment of capital before the creation of the General Mining Association. Only after the company began operations did output expand significantly. However, the absence of significant investment in coal before 1828 was at least in part the result of a restrictive policy with respect to mineral rights which ultimately allowed that firm to control all the mineral rights of the province. At least some of the expansion which took place after 1828 might have been achieved earlier if a different property rights regime had been in place.

12 Temin, "Steam and Waterpower", pp. 196-200.

13 Chandler, "Anthracite Coal", pp. 144-5.

14 *Ibid.*

15 Economic theory indicates that concentrated ownership of mineral rights might have increased provincial income generated by coal production as long as Nova Scotia coal had some monopoly power in the American market. I thank Alasdair Sinclair for this suggestion. Such monopoly power was highly vulnerable to changes in the export market, and in fact was short lived.

A policy which restricted access to mineral rights was adopted by the Crown in the later 18th century. In grants made earlier in that century, the Crown generally did not reserve mineral rights for itself in colonial land grants, except for silver, gold and precious stones. However, when significant quantities of land were being granted in Nova Scotia towards the end of the 18th century, the Crown widened the range of mineral rights it reserved. Although the specific reserved minerals varied from time to time, rights to coal were excluded in most land grants after 1788 and in all grants made after 1808.[16] Those lands granted in Nova Scotia before coal was reserved seem to have possessed no significant coal deposits.[17]

The Crown's decision to retain control of the mineral resources doubtless stemmed from an increased appreciation of the potential value of a wide variety of minerals to an industrializing region. Controlling deposits of coal and other minerals in Nova Scotia allowed the Crown to collect royalties if the minerals were exploited. However, control of mineral rights could alternatively be used to prevent their exploitation in order to inhibit colonial industrialization. In the late 18th century, British economic policy was still influenced by mercantilist principles; the substantial export duty on British coal helped to ensure that coal would be used at home and would not encourage foreign industrialization.[18] While granting leases to mine coal would have provided revenues, the Crown was not eager to see development of raw materials which could stimulate industries competitive with the mother country.[19]

The Crown had another and more personal motive for retaining control of Nova Scotia mineral rights. In 1788 King George III drafted a lease of the mineral rights (excluding coal) of Nova Scotia in favour of his son, the Duke of York, but the document was not executed, apparently because of the unpromising nature of the resources.[20] In spite of the draft lease in favour of the Duke, some leases of coal were granted to Nova Scotians early in the 19th century, but on far more onerous terms than those subsequently offered the GMA. The lack

16 Martell, "Early Coal Mining", p. 157 and *Journals of the House of Assembly of Nova Scotia* [*JHA*] (1846), Appendix 22; *JHA* (1849), Appendix 21.

17 Iron ore was reserved only after 1808, and deposits near Londonderry and near Nictaux Falls were worked by others in spite of the GMA control over most minerals: Donald, *The Canadian Iron and Steel Industry*, pp. 55, 57-8.

18 The duty also had the attraction of yielding revenues to the government to the extent that it failed to prevent exports, an ambiguity of purpose common in many mercantilist policies.

19 D.A. Muise, "The General Mining Association", pp. 72-76 discusses the internal debate over gaining revenue from the coal resources or avoiding a source of competition.

20 Martell, "Early Coal Mining", pp. 164-5 argues that the granting of leases in the province and the delay in the Duke taking possession of the mineral rights stemmed from the document being mislaid. He discusses the leases granted between 1788 and 1826 in some detail. Muise, "The General Mining Association", p. 75 suggests that the document was neglected because the minerals of the province did not seem worth developing.

of free port status for Sydney and Pictou made access to the American market extremely difficult. The terms of these leases greatly hindered significant investment in fixed capital, and the rents and royalties demanded reduced the potential for profitable expansion of output.[21] For example, George William Bown, Thomas Samuel Bown and William Richard Bown of Sydney received a five-year lease of the coal mines at Sydney in 1822 which specified a maximum price of 23 shillings per Winchester chaldron. The royalty on the coal was seven shillings six pence per Winchester chaldron, 30 per cent of the maximum allowed price. The term of the lease was hardly long enough to justify investment in the steam engines and local railroads the GMA later installed. The Bowns were protected in their lease from other mines which might open in Cape Breton to their disadvantage. A lease of Pictou County coal deposits with the more reasonable term of 21 years was granted in 1818 to Edward Mortimer and George Smith of Pictou and William Liddell, a Nova Scotian resident with business ties to Scotland.[22] The lease required payment of the arrears of the former tenant of £1,100, a rent of £370 and a royalty of three shillings per Winchester chaldron when production exceeded a few thousand chaldrons.[23]

Not all requests for leases were granted. The important Halifax merchant Samuel Cunard wrote to James Kempt, lieutenant-governor of Nova Scotia, requesting a lease of the Sydney coal mines in 1826 when the Bowns' lease was nearing expiration and the GMA had not yet established a secure claim to the minerals of Cape Breton. Cunard requested a 30-year lease and stipulated that a free port be named near the mines so that American ships might load there. He offered to pay a yearly rent of £3,000 Halifax currency for the first three years and £6,000 Halifax currency (£5,405 sterling) for the remaining 27 years of the lease, as well as to pay two shillings per chaldron per year on exports exceeding 60,000 chaldrons per year. In light of the request for a free port and with the precedence of heavy rents and royalties in earlier leases, the lieutenant-governor considered his offer too low, and rejected it.[24]

21 Brown, *Coal Fields and Coal Trade*, pp. 66-67.

22 The firm of Liddell engaged in commerce between Nova Scotia and Glasgow from the late 18th century, and John and William Liddell resided in Nova Scotia. Edward Mortimer maintained business connections with this firm throughout his years in Nova Scotia and formed a partnership with William Liddell and George Smith, another Pictou merchant, in order to export timber and other goods, import general merchandise and build ships. Mortimer died in 1819 and the lease was retained by his partners. Susan Buggey, "Edward Mortimer", *Dictionary of Canadian Biography,* Vol. V (Toronto, 1983), pp. 611-2.

23 Evidence provided by George Smith in *JHA* (1845), Appendix 49. The precise quantity which could be raised before the royalty was due is unclear, although it was no more than 3,500 Winchester chaldrons.

24 Letter from Samuel Cunard to James Kempt, 9 January 1826, MG1, vol 3011, no. 20, Public Archives of Nova Scotia [PANS]. The GMA employed Samuel Cunard as their agent, thus compensating him for his lost opportunity in coal mining and transforming a potential enemy

Although leases had been granted to Mortimer, Smith and Liddell and to the Bowns, the draft lease reflecting King George III's intention to grant the mineral resources of the province to his son was still in existence. By 1825 the Duke of York had acquired a significant debt with his jeweller, the firm of Rundell, Bridge, Bigge and Rundell. The firm, in seeking to collect this debt, perceived an opportunity in the draft lease in favour of the Duke and sent a Cornish mining engineer to determine the value of provincial minerals. To their disappointment, copper was not found, but the value of the coal in the province was duly noted. The Duke's brother, King George IV, authorized the signing and execution of a final lease, with coal added to what was already a considerable list of minerals.[25] The firm's initiatives had resulted in the Duke possessing a 60-year lease of all

> gold and silver, coal, iron, stone, lime-stone, slate-stone, slate-rock, tin, copper, lead and all other mines, minerals and ores and all beds and seams of gold, silver, coal, iron, stone, lime-stone, slate-stone, slate-rock, tin, clay, copper, lead and ores of every kind and description belonging to his Majesty within the Province of Nova Scotia...[26]

Mineral rights previously transferred with land grants did not belong to the King and were not included. The document also included a clause explicitly excluding mines currently leased and in operation. The grant was subject to payment of a nominal rent of one pound sterling and a royalty of one shilling sterling per ton of coal raised and sold. The Duke immediately sublet the lease to Rundell, Bridge, Bigge and Bridge in return for 25 per cent of all profits earned from the lease, and they formed the General Mining Association in order to undertake exploitation of this resource.

In spite of the extensive rights granted in the lease to the Duke of York, the document did not transfer the rights to all coal deposits in Nova Scotia, and the GMA quickly acted to secure complete and exclusive control of the resource. Cape Breton was not part of Nova Scotia when King George III had expressed his intention to grant these mineral rights to his son, and therefore its extensive coal deposits were excluded from the lease. In addition, the mines opened under lease to the Bowns and to Liddell and Smith were also excluded from the lease. However, these lessees recognized the impossibility of competing with the new

into a strong ally. This action could be interpreted as a case of metropolitan interests co-opting a member of the elite in the hinterland.

25 Muise, "The General Mining Association", p. 75 provides an excellent discussion of the granting of the lease to the Duke. The Charter of the GMA of 1846 indicates that the Duke of York struck an agreement with John Bridge, Edmond Waller Rundell, Thomas Bigge, and John Gawler Bridge, directors of the Association, in 1826. However, correspondence of 1828 was written over the names Rundell, Bridge and Rundell. See *JHA* (1847), Appendix 28.

26 "Copy of Lease of Mines of Nova Scotia to the Duke of York, 1826", RG1, vol. 460, no. 9, PANS. Printed in *JHA* (1844), Appendix 58.

firm and reluctantly surrendered their leases. The General Mining Association then negotiated a new agreement with the Crown which gave it control of all Cape Breton coal as well as the previously opened mines. Under the terms of this new agreement, the GMA agreed to pay a yearly rent of £3,000 sterling and a royalty of two shillings in Halifax currency for each Newcastle chaldron raised and sold, beyond 20,000 such chaldrons per year. In addition, both Pictou and Sydney were granted free port status.[27]

Comparison of the various leases granted in Nova Scotia requires discussion of the different units of measure employed in the leases. The use of a single standardized unit of measure had not become the norm in the early 19th century.[28] The earlier leases used the common unit of measure of coal in both Britain and Nova Scotia, the Winchester chaldron, a measure of volume of 36 bushels. As a measure of volume, the weight of the coal it contained varied with the specific gravity of the coal, the size of the pieces of coal, and the heaping up of the chaldron, so that conversion of chaldrons to tons cannot be exact. GMA agents testifying to a legislative committee stated that a chaldron of Sydney coal weighed about 28 hundred weight and a chaldron of Pictou coal weighed about 31 hundredweight or about 3,136 and 3,472 pounds per chaldron respectively.[29] A conversion factor of 3,136 pounds per Winchester chaldron is implicit in the table of output Richard Brown presents in his study of the Cape Breton coal industry.[30] Contemporary estimates of the weight of the Winchester chaldrons gave results varying from 3,456 to 3,605 pounds.[31] Thirty hundredweight or 3,360 pounds per chaldron seems a reasonable approximation of the weight of a Winchester chaldron of coal on average in Nova Scotia. The Newcastle chaldron specified in the GMA's agreement with the Crown was twice as large as the much more commonly used Winchester chaldron. The Duke's lease specified that the ton on which a royalty of one shilling was to be paid should equal 2,640 pounds.[32]

The GMA clearly secured better terms than had been granted to previous

27 "Copy of the Charter of the General Mining Association, 1846", RG1, vol. 460, no 14, PANS. Printed in *JHA* (1847), Appendix 28. £111 in Halifax currency equalled £100 sterling, at the official exchange rate. The rent in fact paid was £3,333 in Halifax currency.

28 The chaldron was also used in American cities, and generally appears to have been somewhat smaller than the Winchester chaldron. Coal dealers seemed to have been little troubled by lack of standardization in units of measure. Bills of lading for Pictou coal indicate the number of wagon loads put aboard the ship while the same document calculates the freight rate according to a chaldron of 'Custom House Measure'. Phillips Family Papers, Box 10, Essex Institute, Salem, Massachusetts.

29 *JHA* (1854), Appendix 74.

30 See his *Coal Fields and Coal Trade*, p. 98-99.

31 McKay, "Industry, Work and Community", pp. 870-871. These weights may refer to Pictou coal only.

32 "Copy of Lease of Mines of Nova Scotia to the Duke of York, 1826".

lessees. The royalty specified in the Bowns' lease of seven shillings six pence per Winchester chaldron was more than seven times as great as the two shilling royalty for each Newcastle chaldron owed by the GMA. Although the Bowns were not obligated to pay a fixed rent, the royalty owed would equal the rent paid by the GMA when 8,888 Winchester chaldrons had been sold, while the GMA could raise 40,000 Winchester chaldrons for that rent. The lease held by Liddell and Smith was more generous to them, but still required a royalty three times as great as that owed by the GMA. Cunard offered the Crown less in royalties than received from either of the earlier Pictou or Cape Breton leases, but nonetheless he suggested terms far more favourable to the Crown than the GMA lease. The royalty was twice as large as that paid by the Association, and while his terms allowed him to raise 50 per cent more coal free of royalty than the GMA, the rent owed after three years of operations was almost twice as great as that owed by the GMA. Moreover, leasing Cape Breton coal to Cunard would not have prevented the Crown from gaining additional revenues from other coal leases.[33] When public opinion turned against the GMA, the substantial rent offered by a "principal merchant of Halifax", the large royalties paid by Smith and the Bowns, and the success of the latter operations in spite of these royalties were contrasted with the comparatively small royalties paid by the GMA.[34]

Not only were the terms of the agreement with the GMA more favourable than those paid by previous lessees, but the son and brother of the kings who controlled the minerals may have secured less favourable terms than those subsequently negotiated by the GMA, although differences in the nature of the leases make the comparison ambiguous. Given the assumption made above about the weight of the chaldron, the royalty specified in the GMA's lease was about 70 per cent of the royalty specified in the Duke's grant; with respect to that payment, the GMA clearly had the less onerous obligation. However, the Duke's lease specified a nominal rent of one pound while the GMA paid an annual rent of £3,000 sterling. The rent was doubtless intended to encourage the GMA to develop the resources as quickly as possible, since the rent had to be paid whether or not any coal was mined.[35] As a result, the revenue owed the Crown by the GMA was more than the obligations specified in the Duke's lease until

33 He may in fact have offered to pay a rent of £7,000 in subsequent negotiations — at least that sum is referred to as offered by a principal merchant of Halifax in a report of a committee of the House of Assembly in 1845. *JHA* (1845), Appendix 49.

34 *JHA* (1854), Appendix 49. That same report calculates the rents and royalties the Crown would have collected under the earlier leases in 1841, 1842 and 1843 if the former lessees had sold the same amount of coal as the GMA sold in those years. Of course, higher royalties might well have resulted in diminished sales, and the revenues implied by these calculations may have been unattainable.

35 See Muise, "The General Mining Association", p. 76 where he refers to concern in the colony that the firm would not develop the resources.

output reached 23,500 Newcastle chaldrons. The GMA began producing at that level in 1836, when output shifted from an average of less than 20,000 to more than 35,000 Newcastle chaldrons a year. From that time, the GMA's obligations were less than those of the Duke for the same quantity of coal. For example, in 1850 the GMA paid £6,577 rent and royalty for 54,267 Newcastle chaldrons of coal mined. The Duke would have paid £7,666 for the same quantity, or 17 per cent more.[36] Receiving money now is always more advantageous than receiving money later, and the early large rent compensated at least to some extent for the lower royalty and consequently lower total revenues received later. Perhaps the larger rent paid from the beginning of operations was sufficient compensation for the lower royalty, even though clearly more onerous terms would seem to have been reasonable since the GMA lease added all the mineral rights of Cape Breton to the Duke's grant, and, more importantly, eliminated the possibility of regional competition.

The GMA secured an additional benefit to itself at the expense of the Duke when it negotiated the right to work previously opened mines. The Duke had been granted only the unopened mines in Nova Scotia, but the GMA concentrated its production at the previously opened mines, so that the firm was not in fact working the minerals specified in the Duke's grant which they had subleased. As a result, the GMA felt no obligation to pay the share of profits to the Duke of York or his heirs as specified in their sublease.[37] Of course, holding the sublease of the Duke's grant of unopened mines still explicitly prohibited competition from any new mines.

Although the revenues from the mines were paid to the province, the agreement with the GMA was negotiated in London with the Secretary of State for the Colonies, William Huskisson, and the lieutenant-governor of the province of Nova Scotia played little role in the determination of the rents and royalties. The rejection of Samuel Cunard's offer by James Kempt indicates that he certainly expected the mines to yield a greater revenue than that specified in the agreement with the GMA. Huskisson might not have realized the significance of the unit of measure employed and have inadvertently agreed to too low a royalty.[38] Then again, he might have been fully aware of the implications of the agreement and not have considered the terms of the new lease unduly advantageous. In either case, the governor of the province does not seem to have been correctly apprised of the terms of the agreement, due to confusion over the use of the Newcastle chaldron. In late 1829 the new Lieutenant-Governor, Peregrine Maitland, wrote

36 *JHA* (1854), Appendix 38; *JHA* (1845), Appendix 49.

37 "Copy of the Charter of the General Mining Association, 1846". The Duke died soon after the GMA was founded and, after legal battles, his heirs did eventually gain some recognition of their rights.

38 In 1845 a committee of the House of Assembly of Nova Scotia believed the determination of the unit of measure to have been the result of an error. *JHA* (1845), Appendix 49.

George Murray, then Secretary of State for the colonies, inquiring about the level of the royalty and was told that the rate was two shillings per chaldron, without mention of the type of chaldron. Since the Winchester chaldron was commonly used in both the British and Nova Scotia coal industry, Maitland would naturally assume that the smaller measure was the unit implied. Confusion arose in Nova Scotia about the royalty after output exceeded 20,000 Winchester chaldrons and the GMA indicated that output still had to double before any royalty was due and that the royalty was two shillings per Newcastle, not Winchester, chaldron.[39]

There is no evidence that the GMA used any deceit in having the rent and royalty calculated according to Newcastle chaldrons. In the correspondence of 1828 with William Huskisson and Undersecretary of State for the Colonies R.W. Hay, in which the GMA requested an agreement with the Crown permitting it to work the Cape Breton coal deposits, the firm explicitly referred to the Newcastle chaldron as the unit of measure to be employed.[40] However, the use the GMA made of the two units of measure did nothing to dispel confusion regarding them, since the Winchester chaldron was used in all its business, except in the coal returns prepared for the purpose of calculating the royalty owed. In preparing the coal returns, the number of Winchester chaldrons was halved to give the appropriate measure in Newcastle chaldrons.[41] Nonetheless, this use of the units of measure was neither illegal nor unethical, and indeed was quite natural, since the Winchester chaldron was commonly used in the coal trade and at the same time the GMA's agreement explicitly specified that the royalty was to be calculated according to the Newcastle chaldron. The GMA were certainly skilled negotiators, and could be justifiably accused of sharp dealing if Huskisson did not understand the significance of a Newcastle chaldron.

By 1828 the GMA had a 60-year lease covering all the coal in Nova Scotia and

39 *JHA* (1844), Appendix 58 prints the relevant correspondence. Martell, "Early Coal Mining", pp. 166-7 and Muise, "The General Mining Association", pp. 77-8 discuss the confusion over the calculation of the royalty owed.

40 *JHA* (1844), Appendix 58.

41 The records of the GMA's operations at Sydney have been extensively, though not completely, preserved in MG 1419 at the Beaton Institute, University College of Cape Breton, Sydney, Nova Scotia. Shipping lists, MG 1419 D5, demonstrate the procedure used to calculate the royalty. Ian McKay discusses difficulties presented by the units of measure in the appendix of his thesis, "Industry, Work and Community", pp. 869-871. In general, when the chaldron of coal is mentioned without specification of the type of measure, the Winchester chaldron should be assumed; it would be most unusual for any other unit to be used in the ordinary business of the coal industry. In the *Journals of the House of Assembly of Nova Scotia* more caution must be exercised since quantities were reported to them in Newcastle chaldrons. Since the original coal returns are generally printed for the year reported, and are always in Newcastle chaldrons, summary figures given later can be compared with these when in doubt about the unit of measure.

requiring relatively low rents and royalties. It invested large sums in coal mines, developing them according to the principles of British mining. GMA investments included imported steam engines, railroads and an iron foundry, and the Association supported the immigration of skilled workers and provided housing for them.[42] Output expanded, exports to American markets grew, and in a decade Nova Scotia production surpassed Virginia's. (See Figures 1 and 2). By granting a long term lease with rents and royalties which encouraged investment in the industry, the crown had significantly improved its earlier policy with respect to the coal resources of Nova Scotia.

Nonetheless, excluding local entrepreneurs so that one firm based in the metropolis could control almost all the mineral resources of the province was far from the best policy attainable, and the restrictive leases of the 1820s had more than likely already held growth below its potential. Wider access to coal deposits on more favourable terms would very likely have promoted more extensive development of the industry than occurred. In the 1820s coal prices were high relative to other goods and to their values later in the century, but in the 1830s, as Pennsylvanian anthracite entered the market, prices fell sharply.[43] Capital invested in coal mines in the 1820s would very likely have provided a greater return than capital invested later. In spite of the onerous terms of their leases, both the Bowns and Smith and Liddell found their operations in the 1820s profitable and left the industry with great reluctance.[44] If during the 1820s they and other local entrepreneurs had obtained access to coal deposits at rents and royalties as low as those paid by the GMA and for a term as long, and with access to free ports, they might have been quite capable of generating a substantial expansion in the industry during that decade. Thus while the rapid and dramatic growth of the industry immediately after the entry of the GMA is impressive, the likely impact of British policy with respect to Nova Scotia's coal resources was to diminish rather than encourage growth in the early 19th century.

By the time the GMA was given a lease which encouraged substantial investment in coal mines, Nova Scotia's unique place in the North American market was being undermined. Between 1825 and 1832 improvements in transportation and in techniques of burning anthracite led to the rapid expansion of the market for this superior coal.[45] Both Nova Scotia and Virginia output of bituminous coal were overwhelmed by the huge increases in output of Pennsylvanian anthracite in the 1830s and 1840s. In 1825 Virginia produced 66,720 net tons of bituminous

42 Martell, "Early Coal Mining", pp. 167-8.

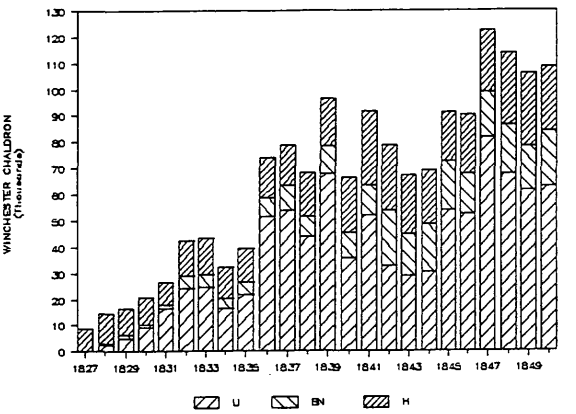
43 George F. Warren and Frank A. Pearson, *Wholesale Prices in the United States for 135 Years, 1720 to 1932* [Cornell University Agricultural Experiment Station, Memoir 142] (Ithaca, 1932). The price indices for "all goods" and for fuel and light permit this comparison.

44 *JHA* (1845), Appendix 49.

45 Chandler, "Anthracite Coal", pp. 155-6.

Figure One

Total Nova Scotia Coal Output,
1827 - 1850



U = U.S.
BN = neighboring colonies
H = Nova Scotia

Shipments to Nova Scotia

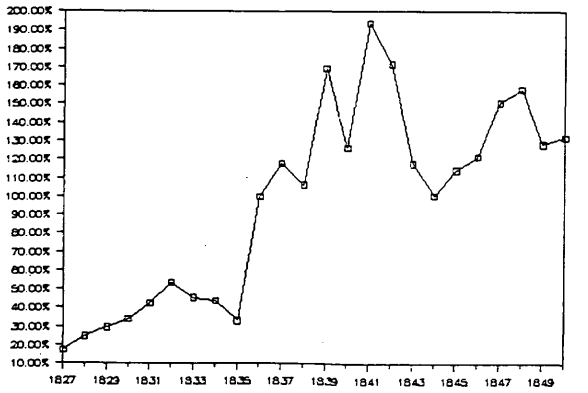
Shipments to neighbouring colonies

Shipments to the United States

SOURCE: *JHA* (1854), Appendix 38.

Figure Two

Ratio of Nova Scotia Coal Output to Virginia Output,
1827 - 1850



SOURCE: *JHA* (1854), Appendix 38; Howard N. Eavenson, *The First Century and a Quarter of American Coal Industry* (Pittsburgh, 1942), p. 443.

coal, and Nova Scotia produced about 5,490 Newcastle chaldrons or 18,446 net tons while Pennsylvania produced 43,119 tons of anthracite. In 1845 Pennsylvanian production had risen to 2,625,757 net tons while Nova Scotia production had reached 150,921 tons and Virginia production along the James River was 134,603 tons.[46] However, a place remained for bituminous coal in American markets because it was burned with anthracite to help regulate the fire and was used for the production of gas. The cost of transporting western deposits of bituminous coal to tidewater markets fell more slowly than the cost of transporting anthracite. The first attempts at connections by canal in the 1830s failed to reduce transportation costs substantially; the natural advantages of transport by water tended to disappear when goods had to be carried uphill across the Appalachians.[47] However, by the early 1850s railroads had been built across the Appalachians and bituminous coal could be brought to tidewater by rail.[48] As a result, any monopoly power Nova Scotia coal might have had in American markets was gone, except to some extent in New England.

Although Nova Scotia's potential share of the American coal market was beginning its inevitable decline by 1828, the GMA had a virtual monopoly in Nova Scotia. The only competition of significance in local markets was imports of British coal in returning timber ships. The differences in the amount of competition in the two markets would have allowed the GMA to increase its profits through price discrimination, that is by charging more for coal in Nova Scotia than in the United States, even after making allowance for transportation costs. A relatively high price could be charged in Nova Scotia because the limited competition meant that only a small reduction in sales would result. However, a high price which was profitable in Nova Scotia could not be applied in the American market where competition from other suppliers was intense. Indeed because Nova Scotia coal was closed out of more distant American markets by rising freight costs, a policy of spatial price discrimination (charging a higher price in local markets where freight costs add little to the cost to the purchaser and reducing the price of coal in more distant markets where increasing freight costs reduce the product's competitiveness) could also potentially increase sales and profits.[49]

Implementing price discrimination required the separation of markets, so that coal sold cheaply in one market could not be reshipped to the market where it would be sold at a higher price. However, the GMA usually sold its coal at the

46 Howard N. Eavenson, *The First Century and a Quarter of American Coal Industry* (Pittsburgh, 1942), pp. 443, 498; *JHA* (1845), Appendix 49; *JHA* (1854), Appendix 38. All figures are net tons.

47 Chandler, "Anthracite Coal", p. 150.

48 Eavenson, *The First Century and a Quarter of American Coal Industry*, pp. 406-11.

49 M.L. Greenhut, and H. Ohta, *Theory of Spatial Price Discrimination* (Durham, 1975), *passim.*

loading wharves in Sydney and Pictou and had no control over the final destination of the coal. Ships' masters not infrequently bought coal on their own account, making payment in cash, in order to sell the coal on speculation when the ship reached its destination. If a lower price had been charged at the loading wharf for coal destined for the United States than for coal destined for more local markets, the ships' masters could easily have profited by claiming the coal would be delivered in the United States while, in fact, delivering it to local markets. The GMA did occasionally ship coal to agents in American cities to be sold there on its own account. If all coal had been sold in that way, price discrimination would have been much easier, but the GMA would have had to bear the risk of shipping and marketing the coal itself. Selling at the wharf distributed the risk among the customers and ships' masters.

The evidence surviving in the GMA shipping lists gives only limited evidence of price discrimination at the point of sale. The ledgers giving the coal shipments of the GMA in Sydney indicate that the firm normally charged all purchasers the same administered price for coal regardless of its destination. Samuel Cunard was an exception to the uniformity of price at point of sale and received a discount at the loading wharf. This privilege resulted from his special relationship with the GMA, since the firm had hired him as an agent responsible for marketing the coal and managing accounts. There is no reason to assume that he passed the discount on to his own customers in Halifax.[50]

While price discrimination did not occur at the wharf, there is substantial evidence that the GMA discriminated through discounts on accounts. Customers who regularly purchased large quantities of coal normally gave a ship's master an order to buy coal on their behalf in Nova Scotia. The cost of the coal was charged to the customer's account with the Halifax Agency, managed by Samuel Cunard. Terms for credit and acceptance of bills of exchange, the usual means of payment, were determined on an individual basis, and as a result provided the opportunity for price discrimination. In late 1839 Samuel Cunard noted that at the end of the shipping season the accounts of customers purchasing more than 3,000 Winchester chaldrons were credited with a discount on their purchases of two shillings per chaldron from the 18 shilling price. Others, who took less, received a one shilling discount.[51] Cunard made no mention of when the practice began, or whether the discount was applied only to coal delivered to American markets. However, as the Select Committee on the subject of the coal mines pointed out in 1845, "this arrangement [of offering volume discounts]

50 See Sydney Mines Shipping lists, 1747-55, MG 1419 D5 I-J, Beaton Institute, for documentation of the reduced price at which coal was sold to Cunard. A letter from Richard Brown to his son Richard H. Brown dated 11 December 1877 complains that the discount is still received by the agent who sells no more cheaply than others and "pockets the difference": Brown Family Papers, MG1, vol. 151, no. 301, PANS.

51 Samuel Cunard to Henry Poole, 25 September 1839, MG 1419, D9B, Beaton Institute.

operates prejudicially upon the coasters supplying the Halifax and other markets, because as they have been in the habit of acting independently, and purchasing coals by the single cargo, they are compelled to pay the higher or retail price".[52] The members of this committee were quite concerned about differences between the domestic and American price of coal. Although they believed that discounts were not dependent on the destination of the coal, they were aware of price differences in local and American markets. They reported that "single cargoes of coal have often been bought from the Agents in the United States, at a less price than they could have been bought for at the pits".[53]

Evidence of price discrimination clearly favouring Americans appears in a letter Cunard wrote to Colonial Secretary Earl Grey in 1848 stating that the GMA offered lower prices to Americans. Complaining of the small profits of the GMA, Samuel Cunard stated: "from these rates [for coal] we have also to make deductions to Manufacturers, resident out of the Province, to induce them to use the Coal..." He also complained of the American duty on coal, although in 1846 that had been reduced from the very high rates of 1842 to 30 per cent *ad valorem* or five shillings six pence to six shillings per chaldron. Cunard implied that the firm also absorbed at least a part of that sum.[54]

The practice of offering discounts was continued on a discriminatory basis as late as 1854. In response to questions from a committee of the legislative assembly, agents for the GMA stated that discounts were offered to anyone buying more than 1,000 chaldrons of coal and exporting them to the United States. They claimed the largest discount ever made was one shilling nine pence in 1853.[55] This claim is contradicted by the letter mentioned above, and it is quite unlikely that in the improved conditions of the 1850s larger discounts were offered than in the depths of the earlier depression. None of this evidence indicates when the offering of discounts exclusively to Americans began, other than sometime before the late 1840s.

After the late 1830s the temptation to maintain the price of coal to Nova Scotians and offer discounts to Americans would have become very great indeed. At that time economic circumstances became quite difficult, as an inflationary boom ended and the American economy entered a severe recession. The price of coal fell and American demand contracted sharply, reducing coal exports to the United States.[56] (See Figure 3). In addition, in 1842 the Americans greatly increased the duty on coal to 13 to 14 shillings for the Winchester chaldron that sold for 18 shillings at the loading wharf. In competitive markets the increase in

52 *JHA* (1845), Appendix 49.

53 *JHA* (1845), Appendix 49.

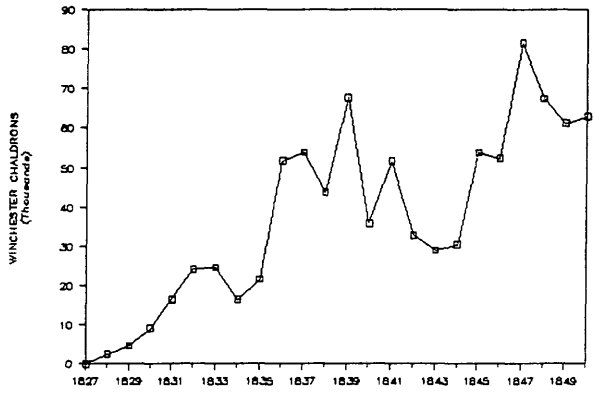
54 *JHA* (1849), Appendix 21.

55 *JHA* (1854), Appendix 74.

56 George F. Warren and Frank A. Pearson, *Prices* (New York, 1933), p. 25.

Figure Three

Nova Scotia Exports to the United States,
1827 - 1850



SOURCE: *JHA* (1854), Appendix 38.

the American tariff would be expected to sharply increase the difference between the American and the Nova Scotia prices.

Prices charged by the GMA in Nova Scotia failed to reflect either the decrease in American prices from 1840 to 1845 or the increase in the American tariff (See Figures 4 and 5). The price of coal at the loading wharf in Sydney remained unchanged while the difference between the price of coal in Halifax and in New York fell sharply after 1840. Indeed from 1839 into the 1850s the loading wharf price remained unchanged in spite of falling American prices and the firm's commitment to selling coal in that market. This behaviour of prices creates the strong suspicion that the loading wharf price was intended for the Nova Scotia market and that adjustments were made in other ways in response to changes in the American market. The assumption that discriminatory discounts were offered in the depths of the depression of the early 1840s is not unreasonable. The price data do not contradict such a conclusion. There is evidence that in 1839 volume discounts were offered which may well have favoured American customers. In 1845 members of the legislature believed Nova Scotia coal was available at lower prices in the United States than in Nova Scotia. Finally Cunard admitted in 1848 that discounts were made which explicitly favoured coal to be delivered to the United States, and it seems unlikely that such a policy would have been implemented only after market conditions had improved.

Free entry into the industry would not have completely eliminated price

discrimination, but would have reduced it to minor significance.[57] The circumstances of perfect competition, which would tend to establish a price of coal within the province equal to the price in the main American markets, less transportation costs and duties, could occur only when there were no locational differences between firms. Whenever the realities of distance are allowed for, each firm has some degree of monopoly power and can raise the price in a region to that charged by the nearest competitor, plus transportation costs from that competitor. However, free entry would have resulted in near competitors being only a few hundred miles distant from each other and would have greatly reduced the degree of control over price. The more firms operating in Nova Scotia, the more we might expect the domestic price to have fallen with the American price. Lower coal prices in turn could have enabled domestic manufactures to compete more easily in both domestic and export markets.

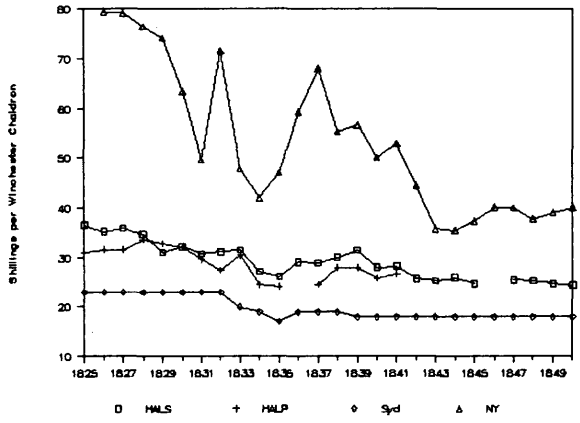
Even if there had been no discrimination on the basis of distance, the firm's ability to block entry into the industry increased the price of coal by raising transportation costs to many Nova Scotians. Coal is not so much produced as moved about, first underground and then above it. Transport of coal overland was far more expensive than sea transport. Although the GMA could for a time supply coal competitively many hundreds of miles down the east coast of the United States, the price of moving coal 50 miles overland within Nova Scotia was prohibitive.

Reservation of mineral rights by the Crown and their subsequent lease to the Duke of York made even the use of coal outcrops in property owners' backyards illegal. While casual use of coal outcrops could hardly have been controlled, the GMA vigorously enforced its property rights and prosecuted anyone who attempted to mine illegally on a significant scale. Few would risk investing even moderate amounts of capital when their business could easily be closed down. John Archibald, writing from Salmon River, Colchester County in 1845 describes the situation well:

> for a number of years I have had reason to believe that there was a good coal field on my property, but I never did anything towards opening the mine till the Winter of 1843... I then sunk a shaft about 30 feet deep, which pierced a seam of coal 2 1/2 feet thick, 30 feet from the surface... At the time I sunk this shaft I thought the Mines contained within this land had not been reserved by the Crown at the time of granting the land, but in the Spring of 1843 the Hon. S. Cunard in passing left word at my house for me to take no further steps or he would prosecute me for so doing...
>
> Farmers must send to the Albion Mines for coal, but as the cost of them

57 Greenhut, and Ohta, *Spatial Price Discrimination, passim.*

Figure Four
Coal Prices
(New York, Halifax, Sydney)



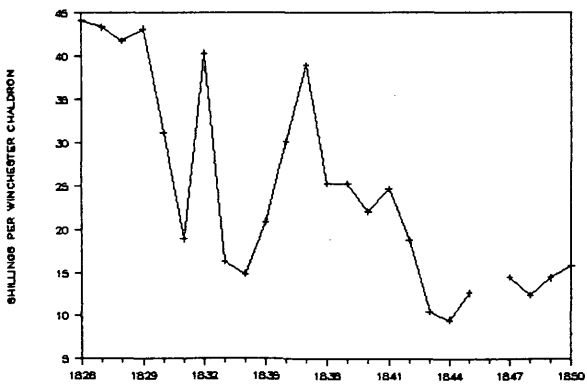
HALS: Price of Sydney coal in Halifax
HALP: Price of Pictou coal in Halifax
SYD: Price of Sydney coal at the loading wharf
NY: Price of anthracite in New York

Prices are converted from shillings to dollars at the standard exchange rate of 5 shillings per dollar.

SOURCES: *The Nova Scotian* (Halifax), 1824-1845; *The British Colonial* (Halifax) 1845-1850; MG 1419, Beaton Institute, Arthur H. Cole, *Working Papers Price Committee*, GA 13.11, Baker Library, Harvard University provided information on coal prices. I also thank Julian Gwyn for generously sharing his own price data with me.

Figure Five

Price Differences
(New York Price less Halifax Price)



> when they reach Truro is greater than 40s per chaldron, this operates as a prohibition upon their use, the same chaldron bought at the same price at Salmon River would not cost the consumer over 22s 6d, the result therefore of opening the Mine would be a large increase in the consumption of coal by persons that now do not use it at all. It would also supersede the use of charcoal by blacksmiths, and by supplying at a moderate price what now costs much to them, would enable this class of tradesmen to supply to farmers their blacksmith's work at a cheaper rate, a boon which would be immediately felt now that the low price of Farming produce makes the payment of tradesmen's bills a serious bar to the improvement of the country.[58]

A seam of coal only two and one-half feet thick was not rich by Nova Scotia standards where seams commonly ranged from eight to twelve feet and reached 27 feet at the Foord seam in Pictou County.[59] Thirty feet is not deep for a mine either, and Archibald himself confessed that the coal was not of the best quality. His mine was unlikely to have become a great enterprise. Yet opening the mine cost him only £100, and so modest an investment might well have earned him a profit, allowing him to accumulate capital for additional investment in this or other enterprises, while also supplying the local population with a cheaper source of fuel than was otherwise available.

Technically, the grant to the Duke allowed for the opening of mines in competition with the GMA under certain circumstances. If the GMA were informed of a coal deposit and given a year in which to decide to open the mine, but declined to do so, the government was allowed to lease the deposit to a rival. In fact, attempts to open mines were unsuccessful. The province was not required to grant any additional leases and as long as the House of Assembly was favourably disposed towards the GMA, it refused to allow rivals to enter the industry, even though coal reserves were left idle. In 1839 Alexander Fraser of New Glasgow petitioned to open a coal mine in his own land outside New Glasgow to serve that market at a small saving to local consumers. His petition was denied on the grounds that the gains to himself and the savings to the people of New Glasgow were too small to justify intruding on the monopoly of a company which had invested so heavily in the region.[60]

In the 1840s the GMA had lost favour with the Assembly, and petitioners were treated differently. In 1844 Abraham Gesner, who developed a process to manufacture kerosene from coal oil, also petitioned to open a mine at Joggins. He noted the increasing shortage of firewood in Cumberland County and argued that:

58 *JHA* (1845), Appendix 49.

59 Bell, *Pictou Coalfield*, p. 95.

60 *JHA* (1839), Appendix 50.

> The opening of the coal mines of the County of Cumberland alone, would not only supply the lack of fuel above mentioned, but would also immediately open an extensive export trade with the United States and yearly increase the public revenue....However creditably and extensively mining may have been carried on in one part of the Province, it does not seem to your memorialist that it should remain inactive in another.[61]

In this case, the House argued that the mine should be opened, but the GMA exercised its prerogative and worked the coal itself through short-term subleases issued to a local resident. Output at that mine remained quite low and GMA investment was minimal. Only after the ending of the GMA control of mineral rights in 1858 did a large number of new mines open in the province.[62]

If independent entrepreneurs expected a profit from developing these deposits, we might expect the GMA also to have found their exploitation profitable. By subleasing to local entrepreneurs the firm could have garnered a portion of the profits to itself with little risk and little increase in administrative complexity and costs. The neglect of deposits which interested others needs more explanation. Possibly the GMA simply decided that the scale of the operations at these local deposits were too small to warrant attention. What was a significant opportunity to a private person may have been of trivial concern to an export-oriented international corporation. In addition, it is likely that the net gain anticipated by the GMA was less than that anticipated by local entrepreneurs. The firm had considerable excess capacity in Cape Breton and at the Albion mine in Pictou County. Since that capital was already sunk and could not easily be liquidated, its real opportunity cost was very low. As a result, the cost of raising another chaldron of coal at the existing mines was far less than the cost of raising coal at a new mine, where the required investment in new capital had a high opportunity cost. The GMA may also have anticipated that losses in revenue from small reductions in sales of coal at established mines could easily offset the net gains, even if larger quantities were sold at new mines.

For example, the mine proposed by Fraser to serve New Glasgow would have had a direct impact on sales from the GMA's Albion mine. While that new mine might have earned a normal profit, the losses from reduced sales at the Albion mine could have exceeded the gains from the new operation. If so, a profitable opportunity for Fraser would not have been profitable for the GMA. The GMA did ship some coal into the Bay of Fundy, although competition from British

61 *JHA* (1845), Appendix 50.

62 *JHA* (1854), Appendix 38. See McKay, "Industry, Work and Community", pp. 16-21 for a discussion of the limited development of coal mines by the GMA in Colchester County. C. Ochiltree MacDonald, *The Coal and Iron Industries of Nova Scotia*, (Halifax, 1909), pp. 21-27, and the report of the mines inspector, *JHA* (1863), Appendix 15, show the development of new mines.

coal brought to Saint John in timber ships was great, and any small gains from its sublease at Joggins may have been offset by reduced sales from Sydney or Pictou. Even at Salmon River a mine might have served enough customers previously purchasing coal from the existing mines to make a new mine unattractive to the GMA, particularly if coal could be shipped along that river.

The GMA's privileges thus prevented small deposits of coal from being developed in places where they could provide cheap supplies of fuel to local customers. In addition, local entrepreneurs found themselves excluded from the coal mining industry. Many of them had specific knowledge of the local resources, economic conditions or potential for local use of coal, but they were denied the opportunity to employ their capital profitably and the industry was denied their capital and management skills. Gesner and other colonial entrepreneurs may have effectively employed their resources in other industries, but restricting avenues for entrepreneurship hardly seems a commendable strategy for economic development.

While the privileges granted to the GMA may have increased the difficulty of economic development in Nova Scotia, there is also evidence that the GMA was inefficient in managing and exploiting the resource. If the GMA chose combinations of natural resources, labour and capital to produce a ton of mined coal which were poorly suited to the local economic environment, the result would have been an increase in the cost of mining coal. Either the price of coal would have increased or the profitability of coal mining would have fallen. While the loss of profits which would have been paid to British shareholders causes little concern here, both an increase in the price of coal and a reluctance to undertake additional investment created by poor returns on earlier endeavours were not beneficial to the province. In general, inefficient use of resources seems a poor way to stimulate development, but this may well be the result when outside interests unfamiliar with the local environment control investment.

In assessing the mining practices of the GMA, it is useful to examine the issue of resource use and appropriate technology in the 19th century. Britain had been a world leader in developing new technology since the 17th century, but their innovations were designed to suit that nation's endowment of resources. Compared to North America, natural resources were scarce in Britain relative to the supplies of capital and labour, especially skilled labour. As a result the "best" technology of the early to mid-19th century used capital and labour relatively freely in order to economize on natural resources. In addition, in Britain generous use of capital to enhance the quality of railroads, canals and other construction projects was justified because reduced maintenance costs offset the relatively low interest payments on the increased capital invested. North Americans were frequently castigated for failing to use the "best" British technology. Indeed North Americans often ignored advanced British techniques because they were ill-suited to a world where natural resources were abundant and capital and labour, especially

skilled labour, were scarce. Railroads or canals were cheaply built, because a reduction in maintenance costs could not compensate for the high interest charges on the increased capital expenditures required to generate the savings. The techniques which were superior in the North American environment economized on the scarce factors of production, capital and labour, and made generous use of abundant natural resources.[63]

Faith in the universal superiority of the most advanced technology is difficult to shake; developed nations today can still be surprised when their highly capital-intensive production methods not only fail to improve Third World conditions, but actually increase suffering by displacing the abundant factor in those conditions, namely labour. The London-based board of directors of the GMA and their British managers may have been similarly slow to realize that the most sophisticated methods of mining coal were not necessarily the best in Nova Scotia. Of course, determining the appropriate mix of capital, labour and natural resources in the Nova Scotia coal industry would require complex and exhaustive calculations based on complete knowledge of all the costs and all the benefits of different combinations of factors of production, information that is not readily available. However, considerable information about resource use can be obtained from the testimony of contemporaries. Also, several insights can be gained by a comparison of resource use in Nova Scotia with that in Pennsylvania, and comparison of steam power use by the GMA with steam power employed in coal mines opened in Nova Scotia after 1858. None of this permits unequivocal conclusions, but the evidence available strongly suggests that the GMA employed resources inappropriately.

In 1842 George Wightman, a Halifax engineer, investigated the reasons for losses at the Albion Mine, and his report gives an assessment of the quality of management by the GMA.[64] The investigation on behalf of the lieutenant-governor was undertaken in response to a plea by the GMA for a reduction in royalties because of its difficulty avoiding losses during a period of severe economic depression. By the 1840s, the GMA could no longer gain the support of the legislature, and the government certainly had no desire to lose revenues as a result of reductions in coal royalties, so there can be no assurance that Wightman's report was entirely unbiased. His conclusion, however, indicates quite clearly that proper management would have resulted in higher profits and that the

63 See W. T. Easterbrook and Hugh G.J. Aitken, *Canadian Economic History* (Toronto, 1956), pp. 262, 278-9, 411-13 for discussions of excessive use of capital in various undertakings as a result of British influence. Robert C. Puth, *American Economic History* (Chicago, 1988), pp. 193-4 summarizes the literature on the influence of factor costs on production techniques in the United States. While there has been considerable discussion of the extent to which capital was substituted for labour in the American economy, there is agreement that North American production techniques readily substituted natural resources for both capital and labour.

64 Muise, "The General Mining Association", p. 85 identifies Wightman; "Copy of Report No. 37 Book No 463, 1842", RG 21A, vol. 3, PANS.

GMA was to blame for the difficulties it suffered.

> On the supposition of coal maintaining its present price at the mines, I have no doubt that were they in the hands of an individual who paid no more for the pits than fair valuation for the labour bestowed upon them, who took no more of the real estate than is really necessary for the working of them, and who paid for the railroad only so much as would bring the carriage by that channel equivalent in expense to what it would be by the old road and the river, he would realise a very ample profit upon his investment.[65]

This observer may have been predisposed to criticize the Association, but it is still most imformative to see what he chose to criticize. He did not complain about the quality of the operation of the mines, stating that "the workings are in as perfect a state as I suppose to be possible. There is ample provision for drainage, for ventilation, and for clearing off the gas..." The point of vulnerability he detected was not the sophistication of techniques used in the workings of the mines or stinginess in expenditure of capital to provide for drainage and ventilation, but excessive and unwise expenditure of capital. In particular Wightman questioned the wisdom of expenditures on a railroad to move coal from the pithead to the loading wharves:

> Of the class of works unnecessarily expensive, the first in magnitude is the railroad. It was constructed upon a much more expensive plan than the occasion fairly warranted; and besides the work was forced forward at a rate that raised prices far above the usual rates of the country. The cost of construction was £54,754, the average cost of railroads in the United States does not exceed £4000 per mile, which for five miles and a quarter, the length of the road in question, is £21,000, leaving for unnecessary expenditure at least £30,000.

He also questioned the decision to construct housing for immigrant workers before the industry required their labour:

> The policy of the directors seems to have been to provide for a great expansion of the trade, and to this end built a village and imported a colony of miners to inhabit it. The propriety of this policy is very questionable, it would have probably been better to have waited till the contingency had arisen....The amount of building not absolutely necessary may be placed at not less than £8,000.

Wightman gives the clear impression that the GMA had fallen into the trap

65 This and the following quotations are from "Copy of Report No. 37 Book No. 463, 1842".

common to the British of underestimating the value of capital in the new world. Criticizing the GMA for investing too much capital in the coal industry may seem strange, and if the capital invested would otherwise have been unavailable we need not fret at its misuse — the failure to earn a return was the stockholders' concern. Nonetheless, when a region is short of capital it is folly to use it to construct housing which sits empty or to build railways where water transportation can be more cheaply improved. The benefit of the capital to Nova Scotia would have been much greater if it had been controlled by investors who directed it to where it would have been most useful.

In addition to his criticism of the GMA's use of capital, Wightman also attacked the company for hiring too much skilled labour:

> On the mode of carrying on the work I beg leave to state that as far as I could learn the colliers are considered as tradesmen, and as such paid high wages. They fix their prices and will not consent to admit any other persons into the works. Two thirds of their work can be done by common labourers and yet they insist upon doing the whole themselves...

Wightman offers his own explanation for the GMA labour policy:

> The mistake by which this state of things [the high price of labour] was brought about, probably arose from applying the maxims and practice of England to a country under different circumstances. There, from the multitude of labourers every man is forced into a particular calling, and from which he cannot, if he wished it, easily escape. The facility with which men can turn to different employments of the same class is scarcely known, and hence it was thought necessary to import a class of regularly instructed miners. The plaster quarriers follow a business similar to mining, and they are as numerous in Hants as the miners in Pictou; but the idea of forming a separate class never enters their minds, neither is there any apprehension on the part of the employers of not finding a sufficient number of workmen.

If higher wages and greater safety resulted from the employment of skilled workers, then Wightman was no friend of the worker when he criticized these practices. While GMA may have adopted its labour policy in part out of a humane concern for its workers, it seems likely that Wightman is correct in his assessment that the Association misunderstood the best way to earn a profit, and that the better treatment of labour was an inadvertent result of the misunderstanding. If so, we have further evidence that the GMA applied British production techniques to Nova Scotia without adapting them to local conditions. In the case of labour, however, GMA policy may have been more beneficial to Nova Scotia than a competitive industry would have been, particularly if the use of skilled labour increased the safety of workers, a factor notoriously neglected by capitalist

markets. However, we still might worry that unskilled resident Nova Scotians were left idle while skilled British colliers were brought in and given the best paying jobs. And while lower labour costs which produced greater profits to be removed to Britain would have done nothing to benefit Nova Scotia, we can also consider that if lower labour costs resulted in cheaper coal, additional investment in coal-using industries might have occurred.

Wightman's view that excessive capital was invested at the Albion mine is supported by evidence about the capital employed in Pennsylvania mines. Coal production began to expand significantly in the anthracite fields at about the same time that GMA was establishing production in Nova Scotia. In the United States when land was granted the mineral rights were alienated with the surface land rights, although the landowner could sell the two separately. Mining was conducted on different scales in different regions, depending on ownership of mineral rights and local policy. In Lehigh County, the Lehigh Company purchased 6,000 acres of coal land long before the coal was marketable and was able to control production and the transportation facilities in that county.[66] Schuylkill County, in contrast, was characterized by a large number of independent operators who strongly resisted the granting of charters of incorporation to mine coal in order to keep the scale of operation small. In both counties far smaller sums were invested in individual mines, or even in the mines of an entire county, than the GMA invested. Although the Lehigh Company invested $500,000 in land, capital equipment and transportation improvements, the average capitalization of Schuylkill County mines was $4,000, and $10,000 sufficed to construct a first-class coal mine.[67]

While the amount of capital invested in mining varied greatly and for proper analysis must be compared to the extent of the coal reserve being developed, the GMA clearly used far more capital than firms in Pennsylvania. Its total capitalization in 1826 of £400,000 sterling, or about $20 million, dwarfs the sums invested in similar areas in Pennsylvania.[68] Some of that capital appears to have been a reserve, not immediately put to use in the coal industry. However, in 1839 a legislative committee estimated that the GMA had invested £109,982 in fixed capital and real estate at the Albion mine alone.[69]

The ratio of total capital invested to output at American mines is difficult to

66 Samuel H. Daddow and Benjamin Bannan, *Coal Iron and Oil; or the Practical American Miner*, (Pottsville, Pa. 1866), pp. 114, 123.

67 C.K. Yearly, Jr., *Enterprise and Anthracite: Economics and Democracy in Schuylkill County, 1820-1875*, (Baltimore, 1961), p. 74.

68 Ian McKay, "The Crisis of Dependent Development", p. 19. See also RG1, vol. 460, no. 14, PANS. The pound in Halifax currency was worth about $4.00 at that time and sterling was valued at 11 per cent more than Halifax currency.

69 *JHA* (1839), Appendix 50. Presumably this information had been provided to them by the Association.

ascertain, but scattered evidence indicates that the ratio of output per horse power in steam engines was much higher in Pennsylvania than in the GMA mines, again indicating less use of capital in the American mines. In 1833 when total coal production was 147,952 net tons, "at least" five engines were reported installed in Schuylkill County mines, while in 1844 output had risen to 839,934 net tons and 28 engines were operating with a total of 1,100 horsepower.[70] In contrast seven steam engines with a total of 129 horse power were working at the Albion mine in 1839 to produce 33,871 Winchester chaldrons of coal, or 53,110 net tons of coal.[71] These rough figures imply that in Schuylkill County about 764 tons of coal were raised per unit of horse power while at the Albion mine only 412 tons of coal were raised per horse power in steam engines. The significance and accuracy of these calculations must not be exaggerated, but in conjunction with other evidence it supports the argument that production in Nova Scotia was more capital-intensive than in Pennsylvania.

The better data on the ratio of output to steam power which are available for mining companies opened in Nova Scotia after 1858 confirm the observation of more intensive use of capital by the GMA. Table One presents information

Table One

Output per Horsepower in Steam Engines, 1866

	OUTPUT	HORSEPOWER	OUTPUT PER HORSEPOWER
Total Including GMA	684,740	1555	440
Total Excluding GMA	269,608	428	629
GMA Mines			
Albion	222,437	612	364
Sydney	132,915	440	302
Lingan	59,780	75	797
Joggins	8,478	9	943
Larger Non-GMA Mines			
Acadia	14,662	43	341
Gowrie	35,704	32	1116
Glace Bay	61,902	65	952
Block House	107,642	90	1196
International	13,364	7	1909

SOURCE: *Journals of the House of Assembly of Nova Scotia* (1866), Appendix 12.

70 Yearly, *Enterprise and Anthracite*, p. 112.

71 *JHA* (1839), Appendix 50. The output is the average over the previous three years to reduce

regarding the output of various mines and the horsepower in steam engines of each mine in 1866. This information must be used cautiously, because it is greatly influenced by the level of trade and conditions at each mine, and comparing a long-established mining company with newer mines may distort the results. However, the figures do support the position that the GMA used more capital-intensive methods than even the large, well-capitalized mines such as the Acadia and the International.[72]

GMA operations at Lingan and The Joggins are significant exceptions to the pattern of GMA capital intensity. The limited use of steam power at The Joggins may reflect the reluctance of the GMA to open that mine at all. However, the GMA opened the mine at Lingan in 1855 on its own initiative, to exploit a profitable market for gas coal in the United States.[73] Since investment in that mine began only after the firm had gained long experience in Nova Scotia, it is tempting to assume that the GMA established its new mine on principles more suited to Nova Scotia conditions.

The tendency of the GMA to use mining methods which preserved coal resources more than other Nova Scotia coal companies can also be seen in the comments made in 1862 by W.A. Hendry, the assistant to the Inspector of Mines:

> Their underground works, so far as I was able to judge from the very limited time at my disposal, are conducted with great regularity and scientific skill. My endeavour was while inspecting the other collieries, to urge upon the proprietors the advantages — as far as circumstances would permit — of adopting the same system as that pursued by Mr. Brown, viz.: to leave a regular and fair distribution of pillarage to support the roof or upper strata until the coal has been worked out from the extreme deep, when the pillars might be removed, and the roof allowed to come down. In some of the new mines, the parties in their first operations removed so much of the coal that the roof or upper strata has come down and prevented the getting out a portion of the coal, which of course is a loss both to the proprietors and the province.[74]

distortion caused by the variability of annual output.

72 By 1869 output per unit of horsepower at the Acadia mine had risen to 790 tons of coal, in spite of severely depressed conditions throughout the industry. The gap between GMA and non-GMA output per horsepower grew as GMA output fell sharply during the contraction while newer firms experienced either less of a decline or even a rise in production. See *JHA* (1869), Appendix 15.

73 Brown, *The Coal Fields and Coal Trade*, p. 86.

74 *JHA* (1863), Appendix, p. 15.

Whether the use of labour and capital in careful mining urged by Hendry to prevent loss of coal reserves was appropriate or excessive cannot be objectively determined now. It may well be the case that he was urging an appropriate level of preservation of coal resources on inexperienced firms who through ignorance had miscalculated the amount of pillarage necessary and created a regrettable loss of coal reserves. Alternatively, taking as much coal as could be easily reached, even though the pillars left failed to support the roof, saved the expense of digging deeply and installing expensive ventilation and drainage equipment, so that while coal was lost, scarce capital was saved.

In summary, the General Mining Association appears to have used more capital and wasted less coal than was usual in North American coal mining. If the excessive capital the GMA invested would otherwise not have been available to Nova Scotia, the loss to the province from excess investment would have been restricted to the impact of any increase in price that resulted from the increased cost of coal mining. However, there is no reason to assume that in the absence of investment by the GMA no foreign capital would have been attracted to the Nova Scotia coal industry. Since Nova Scotia was a small part of the total market for British funds available for foreign investment, the supply of capital to the province should have been quite elastic, although only at a significant premium over the cost of capital in Britain. Moreover, other investors with capital were interested in the coal resources of Nova Scotia, most notably Samuel Cunard who had access to considerable capital, not just from his own wealth, but also through the network of credit typically extended to merchants. Indeed, it is quite possible that if access to the mineral resources of Nova Scotia had been available to all investors, far more capital than the GMA provided might have been attracted to the province, particularly since the company's privileges prevented others from exploiting almost all minerals.

In the absence of the GMA's privileges, the high price paid for capital would have encouraged the use of less capital-intensive techniques and would likely have resulted in more depletion of the coal resources. However, capital would have been saved in the early days of mining when it was expensive, and while additional capital would have been required to open deeper mines to replace the lost coal, the need for that capital would have been pushed into the future, when it became much less expensive. The increased costs of these deeper mines would have been borne by a richer economy which could better afford the expenditure. Capital freed from coal mining in the early 19th century could have been invested elsewhere in Nova Scotia, where it would have been more productive. The inheritors of the coal reserves might then have found that the fruits of alternative investments amply compensated for the coal that had been lost.

Perhaps the only activity more foolish than predicting the future is predicting what might have been in the past. Nonetheless, it seems reasonable to conclude that the allocation of property rights in Nova Scotia coal was made in a distant metropolis in a manner which reduced the potential for industrial development

in the hinterland. Widely distributed local control of the resources would have likely increased the degree of industrialization in the province. The distantly owned firm made extensive use of capital and skilled labour so as to conserve natural resources inappropriately. Blocking entry to scattered coal deposits denied local entrepreneurs both an investment opportunity and a cheap source of energy for their businesses.

The gains in economic development which would have resulted from a more competitive coal industry are uncertain. American experience indicates that the pace of industrialization was greatly influenced by the availability of coal, so that when first anthracite and later western bituminous coal became available, the pace of industrialization greatly increased.[75] In Nova Scotia the local market was much smaller and other key resources may have been lacking; cheap coal might have been insufficient to cause the sustainable expansion of industry. The events of history have denied us the opportunity of knowing with certainty whether Nova Scotia had the potential to become more highly industrialized. The distribution of property rights in coal in the first half of the 19th century did little to help fulfill what potential was there.

75 Chandler, "Anthracite Coal", pp. 150-1.